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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/440,794	11/15/1999	ANDREW D. BAILEY III	LAM1P128/P05	3445

22434 7590 04/01/2002

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EXAMINER
ANDERSON, MATTHEW A

ART UNIT	PAPER NUMBER
1765	10

DATE MAILED: 04/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/440,794	BAILEY III ET AL.	
	Examiner	Art Unit	
	Matthew A. Anderson	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 January 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *31-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *31-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 31-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lymberopoulos et al.(US 6,085,688) in view of Hills et al. (US 6,217,786 B1).

Lymberopoulos et al. discloses a method of and apparatus for producing a plasma for use in manufacturing microelectronics including dry (i.e. gas phase) etching of semiconductor wafers. The chamber shown in Fig 5 is azithmuthally symmetric around the center. The chamber holds the plasma as it is ignited and during the processing of the wafer since there is no separate plasma generation chamber. A window is disclosed in column 6 lines 8-35. The Rf antenna (i.e. a coil is shown in Fig. 5 as 110) is disposed above the plane defined by the wafer (i.e. substrate). Electromagnets (150a and 150B in Fig. 5) are disposed above the wafer. The magnets are disclosed as independently controllable conductors in the abstract and are used to control the plasma density and prevent non-uniform charge build-ups. By magnetically controlling the uniformity of charge distribution, one of ordinary skill in the art would

expect the uniformity of the etching to be controlled. This reads on the changing of the variation in the magnetic field to improve processing uniformity across the substrate. The wafer is placed in the chuck at the bottom of the reaction chamber and gas is flowed in to form a plasma.

Lymberopoulos does not explicitly disclose dc power to the electromagnets but dc is a known power supply configuration. Lymberopoulos is silent as to the gas used in the etching process.

Hills et al. discloses etching a wafer and an oxide on that wafer using specified gases including fluorocarbons and inert carrier gases with Rf plasma (a dry etching process). The specific fluorocarbons of C2F6, C3F6 and C4F8 or mixtures thereof were disclosed as were the carrier gases of Ar, He, Ne, Kr, Xe, or mixtures thereof. These read on the two or more gases of the form CxFyHzOw as defined in the spec lines 19-21 on page 30). Oxygen and nitrogen gases as well as the hydrogen-containing additive gases CH4, H2, H2O, NH3 were also optionally present.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the method disclosure of Lymberopoulos et al. with that of Hills et al. because Lymberopoulos et al. discloses a Rf powered plasma etch process and chamber and Hills et al. discloses a etching gas useable in a Rf powered plasma processing chamber.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to, in a chamber configured as disclosed in claim 31, to control the magnetic field in the region proximate the antenna to improve the processing uniformity

across the substrate because Lymberopoulos et al. discloses such magnetic control in an etching process and such control would have been anticipated to produce an expected result of process uniformity.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to flow the claimed listed gases into such an Rf plasma processing chamber because these gases were known to Hills et al. for Rf processing and their use would have been anticipated to produce the expected result of dry plasma etching.

3. Claims 36-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lymberopoulos et al. and Hills et al. as applied to claims 31-35 above, and further in view of Kondo (US 6,254,966).

Lymberopoulos et al. and Hills et al. are described above.

Kondo et al. discloses a supporter for recording mediums which is made of (see col. 17 lines 55+) glass (a.k.a. amorphous silicon dioxide). The etching of the supporter is performed by dry etching. Plasma is known to those of ordinary skill as a dry etching process since gases are used to form the excited species therein. The gases used to etch include CHF_3, CF_4, C_2F_6, C_3F_8, NF_3, SF_6, C_2F_4, C_3F_6, C_4C_8, C_4F_{10}, C_5F_8, C_6F_{14}, C_3F_6O, C_9F_{10}, CF_3Br, CF_3I, C_2F_5I, CF_2Cl_2, $CFCl_3$, CH_2F_2, C_2HF_5, $C_2H_2F_4$, $C_2H_4F_2$, $C_2H_3F_3$, C_3HF^7, CF_3, $C_2H_2F_3$, $C_8H_3F_5$, Cl_2, CCl_4, $SiCl_4$, BCl_3, PCl_3, CCl_3F, BBr_3, CH_2Cl_2, and mixed gases thereof and other mixed gases containing oxygen, hydrogen, argon, He, N_2, Ne, Ar, Kr, Xe, O_3, CO, CO_2, H_2O, CH_4, C_2H_6, C_3H_8, C_4H_{10}, C_2H_4, C_3H_6, C_4H_8, C_2H_2, and C_3H_4.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine Kondo et al. with the previous cited references because Kondo et al. provides a more complete discussion of the gases used in plasma (i.e. dry etching) applications for etching silicon oxide.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the claimed listed gases in a plasma etching process because the claimed listed gases were known for plasma etching and their use in such an environment would have been anticipated to produce an expected result.

4. Claims 42-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lymberopoulos et al. and Hills et al. as applied to claims 31-35 above, and further in view of Lu (EP 0821397 A2).

Lu et al. discloses a composite SiC that is used to form the chamber wall, chamber roof , collar around the wafer , grounding plane, and window for Rf radiation. The SiC is described as useful for reducing flaking (page 6 lines 35+). The surface after etching was smooth. And, as table 2 shows, the etch rate of the SiC was less than the commonly used quartz or Si.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to form the processing chamber form a material such as SiC that does not substantially react with the reactive gases flown into the processing chamber because such a SiC chamber is suggested by Lu et al. and the use of such a material in such a manner would have been anticipated to produce an expected result . The

examiner notes this reads on a chamber made entirely of SiC since Lu et al discloses walls roof and Rf window made of SiC.

Response to Arguments

5. Applicant's arguments filed 1/24/02 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Lymberopoulos et al. is combined with Hills et al. that describes the gases used in an oxide RF etch process such as that disclosed by Lymberopoulos et al. The examiner only admits that Lymberopoulos et al. is silent as to the gas used in the etching process. Gas must be present because plasma is generated. Lymberopoulos et al. places no limits on the gases used to form the plasma. Hills et al. is combined properly with Lymberopoulos et al. to flesh out the known process gases used in RF plasma etching. The examiner notes no argument against the presented combination.

The argument against the prima facie case to flow the gas chemistries is not persuasive. The gases claimed were listed by Hills et al. as etchant gases used in RF plasma etching. The applicant cannot logically argue that the expected result would be

anything other than RF plasma etching in a controlled manner. The evidence exists throughout both references which deals with RF plasma etching.

The argument that Hills et al. does not teach the required gas is not convincing. The gas described in the abstract is fleshed out and specifically defined in col. 4 lines 55+ and in col. 5 lines 1-42. The fluorocarbon gases and mixtures thereof listed reads on 2 or more of the $C_xF_yH_zO_w$ where z and w are both zero as allowed in the applicant's specification on page 30.

The argument that there is no teaching in Lymberopoulos et al. concerning changing the radial variation in a controlled magnetic field within a plasma processing chamber in a region proximate to an antenna to improve the processing uniformity across said substrate is not persuasive. In response, the examiner must point directly to the abstract in which optimization of the magnetic field is used to selectively control the plasma density, to selectively confine process gas species, and to eliminate uneven charge-up on the workpiece. The background explains that the need to eliminate uneven charging on the workpiece is the goal of the invention (see col. 1 and 2). Uneven charge build up is result of non-uniform processing across the substrate. Thus, uniform processing across the substrate is at least suggested by the Lymberopoulos et al. patent.

The recitation of pieces of claim 31 is noted.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MAA
March 27, 2002

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